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Institutional Frameworks Case Studies
Bunker Hill Superfund Site, Idaho

1.0 Introduction/Summary

The Bunker Hill Superfund Site is a former mining and metal smelting area located in Shoshone County in the panhandle of northern Idaho. The site has been used for mining and metallurgy since the 1880s. In 1983 the site was placed on the National Priorities List (NPL) for Superfund cleanup due to the presence of lead, arsenic, cadmium, zinc and other heavy metals. Environmental and health monitoring data show significant levels of soil contamination, ground water contamination, and elevated levels of blood lead in area children. Since the NPL listing, remedial actions have been selected for both populated and non-populated areas of the site. These remedial actions involve a combination of contaminant removal and other physical protection measures, institutional protection measures, and individual protection measures.

The remainder of this case study is organized as follows.

- Section 2 provides background on the site, the sources of contamination, key players, and a chronology of major milestones.
- Section 3 describes how contamination problems were identified and addressed.
- Section 4 discusses the protective measures that have been considered and selected to address the contamination.
- Section 5 outlines funding sources and legal authorities employed.
- Section 6 discusses lessons learned from problem assessment and the implementation of protective measures.
- Section 7 lists references consulted for the case study.

2.0 Background

2.1 Site Description

The Bunker Hill Superfund site is 21 square miles and includes former mining and smelting facilities located along I-90 in the Silver Valley, in Shoshone County in the panhandle of northern Idaho. The Coeur D'Alene River and several of its tributaries run through the site. The site encompasses the four incorporated communities of Pinehurst, Smelterville, Wardner, Kellogg, and Page, as well as the three unincorporated communities of Ross Ranch, Elizabeth Park, and Montgomery Gulch. The total population of those living within the site is roughly 6,000 people.

Specific industrial operations in the site have included the Bunker Hill Mining and Metallurgical complex, the Bunker mine, a concentrator, a lead smelter, an electrolytic zinc plan, a phosphoric acid and fertilizer plant, a cadmium plant, a number of mills, and sulfuric acid plants. Area mining and mill operations began in the 1880s and continued until 1991. Area smelting operations began in 1917 and continued until 1981. The mines and smelters produced lead, cadmium, zinc, silver, gold, and other alloys of heavy metals.

During the late 1800s and early 1900s, local timber was harvested from the area hillsides to support the mining business.

In addition to the mining and smelting operations, historic land uses have included residential and some commercial uses.

For purposes of investigation and development of protective measures, the Bunker Hill Superfund site has been divided into four parts: 1) the populated area, which includes residential and commercial properties, rights of way, and public use areas; 2) the non-populated area, which includes the smelter complex, tailings impoundments, surrounding hills, groundwater, sediments and surface water, dust, and adjacent commercial properties; 3) the long-term management of acid mine drainage (AMD); and 4) the mining-related contamination in the broader Coeur d'Alene River Basin. This case study primarily focuses on the first, the populated area.

2.2 Sources of Contamination

The primary contaminants of concern at the Bunker Hill Superfund site are lead, arsenic, cadmium, zinc and other heavy metals. The primary environmental media affected by contamination are soils, surface waters, and groundwater.

Historic discharges of wastes from mining and milling operations dispersed lead, arsenic, cadmium, zinc, and other heavy metals throughout the Coeur D'Alene River Basin. Dispersion primarily occurred through deposition of airborne particulate depositions (from smelter stacks), alluvial depositions of tailings dumped in the river, and migration from other sources on the active mining and metal smelting site. Several thousands of tons of mill tailing, mine waste rock, and ore concentrates are spread throughout the basin.

Prior to 1938, all liquid and solid residues of mine tailings from the Bunker Hill industrial complex were discharged directly into the Coeur D'Alene River and its tributaries. When the river flooded, these residues were deposited onto the valley floor and have contaminated soil and ground water. After 1938, liquid wastes, including mine pump effluent, were directed to a pond in the central impoundment area (CIA) for settling and then discharged into the river. In the early 1970s, a central treatment plant was constructed on the edge of the pond to treat water before discharging it to the river. However, the bottom of the pond was not sealed, and it is believed that the CIA has contributed an up to 680 pounds per day of combined metals loading into the groundwater.

In 1973 a fire destroyed the smelter bag house, a primary component of the smelter's air pollution control system. In a one-year period following the fire, over 1,000 tons of particulate lead were released into the air and settled on surrounding soils, destroying large areas of vegetation.

The Bunker Hill Mine includes roughly 150 miles of underground tunnels. Surface waters drain through the tunnels, leaching heavy metals along the way. The result is highly acidic main drainage, which discharges from the Kellogg Tunnel and is diverted to a wastewater treatment plant. Acid mine drainage is a result of acid-forming reactions occurring within the mine between water, oxygen, sulfide minerals, and bacteria. The AMD is acidic and contains dissolved and suspended heavy metals that have demonstrated significant aquatic toxicity.

AMD discharge from the mine is expected to continue indefinitely. Current technology is unable to stop the formation and discharge of AMD from the mine.

Because of these and other sources of contamination, in 1982 the site was proposed for the National Priorities List under the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), better known as Superfund. After the site was added to the NPL in 1983, EPA and the State of Idaho began further investigating the nature and extent of the contamination throughout the Bunker Hill Superfund site.

2.3 Key Players and Roles

- United States Environmental Protection Agency (EPA) – has been the lead agency overseeing cleanup, through its Region 10 offices.
- Centers for Disease Control (CDC) – was involved in the early health studies and establishing the Lead Health Intervention Program.
- Idaho Department of Environmental Quality (ID DEQ) – oversees the cleanup work of the potentially responsible parties and works in cooperation with EPA.
- Idaho Department of Health and Welfare (IDHW) – was involved in the early health studies.
- Panhandle Health District (PHD) – oversees and runs the Institutional Controls Program.
- Potentially Responsible Parties (PRPs) – are paying for a portion of the cleanup, largely in the populated areas.

2.4 Chronology of Major Milestones

Year	**Activity**
1880s	Mining operations began
1917	Smelting operations began
1973	Bag house fire released lead particulates in air emissions
1974	Elevated lead blood levels detected in children
1981	Smelter shut down
1983	Site listed on NPL
1985	Lead Health Intervention Program initiated by CDC and ATSDR
1985-1987	RI/FS conducted for populated and non-populated areas
1986	Emergency removal of soil from public areas (parks and schools)
1989	Residential yard cleanup begun
1991	ROD signed for populated areas
1992	ROD signed for non-populated areas
1994-1996	Smelter buildings and stacks demolished
1996	ROD Amendment for non-populated areas
1997	South Fork of Coeur D'Alene River diverted for tailings removal
1998	1,400 residential yards cleaned up, soil removed from Smelterville flats, and hydroseeding revegetation of hillsides begun
1998	RI/FS initiated to address long-term management of acid mine drainage, and mining-related contamination of the greater Coeur

Year	Activity
	d'Alene River Basin
1999-2000	5-year reviews of populated and non-populated areas, CIA closure

3.0 Problem Assessment

The Bunker Hill Superfund site has been extensively studied by State and Federal agencies over the past 20 years. Although elevated levels of lead and zinc in the Coeur D'Alene River and adjoining wetlands may be affecting migratory waterfowl and aquatic organisms, including native fish species, the primary driver for site investigation and remediation has been public health concerns.

3.1 First Public Health Study

After the bag house fire in 1973, the local public became concerned about the effects of air pollution on human health. In 1974, a public health study was launched, as well as concurrent epidemiological and environmental investigations. The study was conducted by the Centers for Disease Control (CDC), the Idaho Department of Health and Welfare (IDHW), and Panhandle Health District (PHD). The study included soil and household dust sampling and analysis. As well, blood lead levels were tested in children ages 1 through 9. The soil samples taken included the upper 1-inch of soil.

The findings of the 1974 investigations were as follows.

Contaminant and Medium	Range	Averages	Federal Action Level
Residential Lead Soil Concentrations	35 to 24,600 ppm	Kellogg 3073 Pinehurst 1169 Smelterville 7386 Page 3609 Wardner 4863 ppm	1000 ppm
Household Dust Lead Concentrations	940 to 26,700 ppm	Kellogg 8316 Pinehurst 2317 Smelterville 11,997 Wardner 5318 ppm	1000 ppm
Blood Lead Levels	11 to 164 ug/dl	Kellogg 49.6 Pinehurst 34.9 Smelterville 68.1 Page 48.7 Wardner 42.9 ug/dl	10 ug/dl (Remedial Action Objective of less than 5% of childer with blood lead levels of 10 ug/dl or greater)

The epidemiological and environmental investigations concluded that atmospheric emissions of particulate lead were the primary source of elevated blood lead levels in local children.

These findings lead to EPA's first involvement on the site. In 1977, the U.S. Environmental Protection Agency (EPA) ordered Gulf Resources and Chemical Corporation, the smelter operators at the time, to install sulfur dioxide pollution control equipment in the stacks.

3.2 Lead Health Study

The IDHW developed soil sampling protocols as part of its 1983 Lead Health Study. Two surface soil samples (top 1-inch) were taken from each residence, one from the front and one from the back yard of each property. These samples were composited into a single sample for laboratory analysis.

The early health studies primarily focused on the health impacts for children, as exposures to lead are known to affect learning and cognitive development in children. As such, testing focused on households with children present.

The findings of the 1983 Lead Health Study were as follows.

Contaminant and Medium	**Range**	**Averages**	**Federal Action Level**
Lead Soil Concentrations	83 to 41200 ppm	Pinehurst 814 Smelterville 6231 ppm	1000 ppm
Household Dust Lead Concentrations	53 to 20700 ppm	Pinehurst 590 Smelterville 4734 ppm	1000 ppm
Blood Lead Levels	1 to 45 ug/dl	Pinehurst 12.2 Smelterville 21.4 ug/dl	10 ug/dl Remedial Action Objective

Perhaps because the 1983 Lead Health Study was conducted after the smelter had been closed, blood lead levels in children showed a significant drop off. However, the average levels were still considerably higher than levels considered protective of human health.

As a result of the findings of this Lead Health Study, the CDC initiated a Lead Health Intervention Program, which included ongoing blood lead monitoring for children and educational information about things that residents could do to reduce household exposures to lead. This lead health program was initiated prior to the Records of Decision (ROD) under Superfund, signed in 1991 and 1992. However, the activities of this program were incorporated into the 1992 ROD. The PHD currently runs the blood lead monitoring program and education program.

3.3 RI/FS Studies

As a result of the site being placed on the Superfund NPL list in 1983, two phases of Remedial Investigation/Feasibility Studies (RI/FS) were conducted in the mid-to-late 1980s. The RI/FS included sampling of soil, house dust, groundwater, and surface waters. During 1985-1987, Phase I sampling occurred in Smelterville, Kellogg, Wardner, and Page. In 1989, Phase II RI/FS sampling occurred in Pinehurst and Elizabeth Park.

Sampling in the populated areas has focused primarily on contamination in residential yard soils and household dust. In general, soil samples collected during phase I and II of the RI/FS were analyzed for pH and the following 12 metals: antimony, arsenic, beryllium, cadmium, cobalt,

copper, lead, mercury, nickel, selenium, silver, and zinc. The samples were collected to a depth of 18 inches below ground surface to determine the depth of remediation at residential properties. Sample intervals included 0-1", 1-6", 6-12", and 12-18". One sample was take per 500 square feet, with a minimum of two sample locations per property.

The Residential House Dust Survey analyzed the contents of vacuum cleaner bags furnished by residents for lead. Dust sampled from vacuumed homes is intended to monitor exposures to dust for a community (by averaging among many homes). Since 1996, house dust samples have included samples taken from special floor mats placed at the entries of homes, in addition to the vacuum bag sampling. The floor mat sampling provides information on dust loading and lead loading rates (or the rates of dust and lead entering a home), in addition to measuring the concentration of lead in house dust.

Results of the 1985-1989 Phase I and II RI/FS under Superfund showed residential soil and household dust concentrations to be higher than is consider protective of human health. The lead levels initiated an EPA emergency removal of soil from public areas (parks and schools) in 1986 and the beginning of the residential yard cleanup in 1989. The results of the RI/FS have also lead to the development of the Record of Decision (ROD) for the populated areas, which was signed in 1991. The 1991 populated area ROD focuses on excavating contaminated soil and sod and replacing it with clean soil.

Contaminant and Medium (1989 data)	**Range**	**Averages**	**Federal Action Level**
Lead Soil Concentrations	53 to 9230 ppm	Kellogg 2846 Smelterville 2975 Page 1156 Wardner 1304	1000 ppm
Household Dust Lead Concentrations	69 to 52,700 ppm	Kellogg 4568 Smelterville 1628 Page 794 Wardner 610	1000 ppm
Blood Lead Levels	3 to 41 ug/dl	Kellogg 10.8 Smelterville 14.6 Page 12.5 Wardner 11.8 ug/dl	10 ug/dl Remedial Action Objective

Sampling in the non-populated areas included soils, surface water, and ground water. Surface water sampling has been conducted since 1987 at thirteen different locations throughout the Bunker Hill Superfund site. Contaminants of concern include arsenic, cadmium, lead, and zinc. Since 1988, ground water sampling has occurred at 51 wells. Contaminants of concern are also arsenic, cadmium, lead, and zinc.

Water chemistry data was collected during a 1998/1999 monitoring program of the acid mine drainage (AMD) discharged through the Kellogg Tunnel. Contaminants of concern in the AMD include: cadmium, copper, lead, mercury, and zinc. Data was also collected on a number of other metals, and on pH and total suspended solids. Flow and water quality measurements are currently being performed in the Bunker Hill Mine to better understand how the AMD develops. This information will be used to reduce the generation of the AMD, to the extent possible, and in evaluating treatment options.

Levels of contamination found in the surface water and groundwater were in excess of Clean Water Act Standards and Safe Drinking Water Act Standards and contributed to the development of the 1992 ROD for the non-populated areas. Chemical-specific groundwater cleanup levels were based on Safe Drinking Water Act and state standards and include: arsenic .05 mg/l; cadmium .005 mg/l; lead .05 mg/l; and zinc 58 mg/l. The chemical specific surface water quality cleanup levels were based on the Clean Water Act standards and include: cadmium .0011 mg/l lead .0032 mg/l; and zinc .11 mg/l. Institutional protection measures in the form of land use restrictions and other administrative restrictions were identified for those populated and non-populated areas where onsite lead concentrations exceed 100 ppm.

In 1998, a RI/FS was initiated for the third cleanup area at the Bunker Hill Superfund site, the long-term management of AMD from the Bunker Hill Mine. Also in 1998, EPA initiated a RI/FS for the fourth cleanup area to address mining-related contamination in the greater Coeur d'Alene River Basin.

4.0 Protective Measures

4.1 Approaches Considered

EPA Region 10 has been the lead authority for Cleanup at Bunker Hill under Superfund. Approaches considered for cleanup of the populated area included total soil removal, treatment in place, partial soil removal, and no action. Total soil removal was considered to be too expensive. The "no action" alternative was not considered to be protective of human health and the environment. Treatment in place was not considered to be technologically feasible. Thus, partial soil removal was selected, as discussed below.

4.2 Approaches Selected

The following section describes the protective measures contained in the RODs of 1991 and 1992. Remediation of the Bunker Hill Superfund site has involved a combination of soil removal and other physical protection measures, institutional protection measures, and individual protection measures. Each element of the remediation is implemented by a number of different government agencies and other organizations and funded through different sources, and is described in more detail below.

4.2.1 Physical Protection Measures

In the populated area, the physical protective measures have largely included the removal and replacement of contaminated soil in residential yards, public areas, and rights-of-way. Exposure to lead in residential solids was identified as the primary health risk to children and pregnant women within the populated areas of the site.

As mentioned above, EPA cleaned up some city parks and school playgrounds in 1986 as part of a CERCLA removal action. The yard soil removal program was initiated in 1989 as a CERCLA time-critical removal action to replace contaminated soils in yards of homes where young children at highest risk of lead poisoning lived. After the signing of the 1991 ROD for populated areas, the yard cleanup program has focused on removal of soil from all residential yards where lead contamination is in excess of 1,000 ppm and replacement with clean soil and sod. If contamination was detected in the 6-12" sampling interval, then soils was removed to 12

inches. If contamination was detected in the 12-18" interval, then soil was removed to a minimum of 18" and a visible barrier was installed. Clean soil was used as backfill.

The 1,000 ppm action level was selected based on site-specific analyses of the relationship between observed blood lead levels among children and environmental media lead concentrations at the site. The first use of what later became know as the EPA Integrated Exposure Uptake Bio-kinetic Model for lead in formulating cleanup criteria for lead in soils and dust was for the Bunker Hill Superfund Site. The performance goal for the soil and sod excavations and replacement with clean materials is resulting mean soil lead concentrations in residential areas of approximately 200 to 300 ppm.

Prior to 1994, and following EPA's emergency removal action, EPA and the Panhandle Health Districted conducted the residential soil removals. Since 1994, the yard soil removal program has been implemented by the potentially responsible parties (PRPs) pursuant to the 1991 populated area ROD and 1994 signed Consent Decree. The PRPs are scheduled to remediate 200 residential yards each year until all yards, commercial properties, and rights-of-way in the populated area with lead-contaminated soils greater than or equal to 1,000 ppm have been remediated. To date, soil has been removed from over 1,500 residential yards. Completion of remedial activities in the populated area is expected by 2003 and will include roughly 2,000 yards.

In addition to removal and replacement of contaminated surface soil and sod, the selected remedy in the 1991 populated area ROD includes the following:

- Disposal of contaminated materials at an onsite repository
- Revegetation of yards
- Dust suppression during remediation
- Institutional protection measures for barrier management
- Long-term environmental monitoring for evaluation of remedial effectiveness

All but the last two items in the remedy are provided by the PRPs. The last two are included as part of the Institutional Control Program of the Panhandle Health District, described in further detail below.

The 1991 ROD did not address the removal of household dust, however yard soil is considered to be a source of metal-contaminated dust in home interiors, and thus the ROD addressed the removal of a source of contaminated dust. House dust was covered under the 1992 ROD. Remedial measures for house dust included: cleaning all homes where house dust exceeded 1,000 ppm after remedial actions for yard soil were completed; loaning high-efficiency vacuums to residents; and developing and implementing an interior dust monitoring program. Institutional protection measures in the form of land use restrictions and other administrative restrictions were identified for those populated and non-populated areas where onsite lead concentrations exceed 100 ppm.

In the non-populated area, physical protective measures have focused primarily on the removal and replacement of contaminated soils; demolition and removal of contaminated buildings and structures; revegetation of the hillsides; consolidation of tailings materials; treatment of groundwater, surface water, and AMD; and installation of barriers and caps. Because of the large size and varying geography of the site and the variety of contaminated media (soils, groundwater, surface water, AMD), a wide number of remedies were selected for the non-populated area. This case study does not include the details of those selected remedies.

4.2.2 Institutional Protection Measures

In 1995, the Idaho Legislature gave the Board of the Panhandle Health District authority to promulgate rules governing contaminant management. The purpose of these rules is to ensure that activities involving excavations, building, development, construction and renovation and grading within the Bunker Hill Superfund Site provide for the installation and maintenance of barriers and implementation of other contaminant management standards to preclude the migration of, and particularly human exposure to, contaminants within the site as necessary to protect the public health and the environment.

Since 1995, the Panhandle Health District (PHD) has overseen the Institutional Controls Program (ICP).[1] The ICP has three primary components.

- A locally enforced set of rules and regulations to ensure the integrity of clean soil and other protective barriers placed over contaminants left throughout the Bunker Hill Superfund Site.
- Education, sampling assistance, clean soils for small projects (defined as less than one cubic yard of material), pickup of soil removed from small projects, and a permanent disposal location for contaminated solids generated site wide.
- Regulations and assistance with construction and renovation projects on building interiors that involve ceiling and attic work, insulation removal, and work in dirt basements and crawl spaces.

The Bunker Hill Superfund Task Force, which consists of local citizens, decided on three principles by which all elements of the remediation and ICP would be evaluated:

- Minimize inconvenience to and costs for homeowners.
- Use existing controls and local agencies to the maximum extent possible.
- The ICP should be self-sustaining and not impose significant costs on homeowners.

Operation of the entire Bunker Hill ICP costs roughly $175,000 per year and includes 1.75 full-time equivalents. The PRPs are committed to funding the first ten years of the ICP.

In addition to conducting ongoing blood level monitoring and providing information about individual protective measures (described below), the PHD is also responsible enforcing for the following institutional protection measures.

- Contractor Licensing. All contractors involved in soil excavations, building renovation, or other activities within the Bunker Hill Superfund site that may break an existing barrier or result in the installation of a new one must be licensed by the PHD to ensure that work is done in such a manner to protect both workers and site residents from exposure to heavy metals, especially lead. To obtain a license, contractors must provide proof of participation in an educational program provided by PHD and must pass a test on the reasons for, and the methods of contaminant management within, the Bunker Hill Superfund site.

- Large Project Work Permits. A large project work permit is required for exterior work involving any of the following activities: excavation of more than one cubic yard of contaminated soil or debris; improvement of property adjacent to exposed contaminated

[1] Note that the Bunker Hill ICP includes activities that go beyond what the Area-Wide Soil Contamination Task Force defines as institutional protection measures.

soil; subdivisions and planned unit developments; building demolition; and land clearing activities that expose contaminated material. The PHD provides large work permits. The PHD permit must be issued and valid before work permits issued by any other entity with jurisdiction of land use issues is valid (e.g., the city will not provide a work permit without a PHD permit first). In this regard, the ICP has been tied into the community planning and zoning processes.

- Interior Work Permits. An interior work permit is required for work involving any of the following activities: insulation (installation or removal); work in basements or crawl spaces with exposed soils that are contaminated; ceiling or attic work that is likely to disturb contaminated dust or debris; excavation of contaminated soil from any interior space; and duct work (furnace or air conditioning). The PHD provides the interior work permits. The PHD permit must be issued and valid before work permits issued by any other entity with jurisdiction of land use issues is valid (e.g., the city will not provide a work permit without a PHD permit first).

- Barrier Option Plan. A Barrier Option Plan may be required on large projects in conjunction with a large project work permit. All projects that require engineered plans, including planned unit development and new subdivisions, must include a detailed barrier option plan (BOP) prepared by a qualified professional (architect or engineer). Information pertinent to the BOP is kept on file in the ICP tracking system maintained by the PHD.

- Inspections. The PHD conducts inspection of work conducted under an Interior or Large Project Work Permit. The PHD provides written approval of work conducted and enters that information in the database tracking system, or notes the reasons for disapproval and steps that must be taken to complete the work. Upon completion of the work to the PHD's satisfaction, the PHD records the final approval in the database tracking system and this constitutes the record of compliance for the project.

The PHD also provides the following other services:

- Data Collection and Tracking. The PHD collects and tracks data relevant to the ICP, including information on residential projects and yard cleanups, licensed contractors, permits issued, barrier option plans, and locations of existing barriers and caps.

- Landfill. The PHD provides a landfill where small project soil is disposed.

4.2.3 Individual Protection Measures (as part of public education/outreach)

The PHD conducts the ongoing public education and outreach program. As part of that program, PHD recommends the following individual protection measures.

- To avoid exposure while conducting home remodeling projects, follow the advice listed in the "Building Renovation-Interior Projects" and "Interior Projects" brochures provided by the Panhandle Health District. These brochures identify those projects requiring an Interior Work Permit (described above) and provide advice to home owners on the following topics: the placement of barriers and other measures (such as vacuuming) to control dust; the use of personal protection measures (such as respirators and coveralls); and the use of gravel to cover soil in crawl spaces or basements.

- For extensive excavation and demolition activities, follow the advice provided in the "Health and Safety Plan" provided for large projects. That brochure identifies those projects requiring a Large Project Work Permit (described above) and provides advice to homeowners on personal protective measures to use while undertaking small projects around the home and yard.

- While working on small projects around the home and yard, the following are recommended.
  - Avoid hand to mouth activities while working in or around soil and dust. These include smoking, chewing tobacco, or eating.
  - Wear coveralls when working with soils and dust.
  - Launder dirty coveralls and other garments separately from other household laundry. Soiled clothes should be stored in a plastic bag.
  - Boots should be brushed off or washed prior to leaving the work site or entering the house.
  - Avoid exposing yourself or others, especially young children or expectant mothers, to contaminated soils, dust, clothing, tools, etc.
  - Control dust by wetting soils prior to digging – do not over wet.
  - Control soil erosion.
  - Wash you hands thoroughly prior to eating.
  - Shower or bathe as soon as you have completed the project or quit for the day.

4.2.4 Technical Assistance/Services

The PHD also provides a variety of technical assistance/services, including the following.

- Making available respirators, coveralls, plastic, gravel and vacuums to homeowners upon request for use in interior projects.
- Providing guidance for homeowners about the use of plastic covering, temporary barriers such as plastic sheeting, gravel cover, removal of insulation, vacuuming, control of dust, and use of personal protective gear (e.g., respirators and coveralls).
- Providing containers and hauling for homeowners conducting small projects, defined as the removal of less than one cubic yard of soil.
- Providing up to one cubic yard of clean fill materials for homeowners conducting small projects.

4.2.5 Health Monitoring

As described above, the Panhandle Health District has conducted blood lead monitoring since 1995.

5.0 Funding and Legal Authorities

5.1 Funding Sources and Mechanisms

The funding for activities at Bunker Hill has come from primarily from three sources: EPA, the Idaho Department of Environmental Quality, and the potentially responsible parties (PRPs).

EPA estimates it will cost roughly $160 million for all cleanup at the site – both populated and non-populated areas. Roughly $126 million will come from State and Federal sources. To date,

cleanup not provided by the PRPs has been paid for by money from the EPA Superfund Trust Fund. Under law, the State of Idaho is required to match 10% of Federal funds used for cleanup, and conduct and pay for all operational and maintenance costs thereafter. Most of the cleanup cost is for the non-populated area where no PRP is performing cleanup.

Under a 1994 Consent Decree between EPA, the State of Idaho, and PRPs, the PRPs have been involved in paying for the residential soil cleanup work. PRPs will pay for roughly $34 million, mostly in the populated areas. Costs for the yard removal prior to 1994 were approximately $20,000 per residence. After the PRPs took over the remediation, costs dropped to approximately $15,000 per residence. The Idaho Department of Environmental Quality oversees the cleanup work performed by the PRPs. Several of the PRPs at the Bunker Hill Site have declared bankruptcy since the closing of the mine and smelter operations. These PRPs have established trust funds to pay for cleanup costs, as part of their bankruptcy settlements.

5.2 Legal Authorities

EPA has been the lead agency at Bunker Hill by authority provided by the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Superfund.

The Panhandle Health District's authority for overseeing the Institutional Controls Program is provided by the Idaho State Legislature, as well as through inclusion in the RODs under Superfund.

6.0 Lessons Learned

6.1 What Worked Well

According to ongoing sampling results, average house dust lead concentrations dropped throughout the 1990s in all site communities. By 1999, average concentrations for all communities were under 1000 ppm. As well, blood lead levels in children have continued to drop. As of 1999, the percent of children exceeding the 10 ug/dl Blood Lead Remedial Objective was 4% in Smelterville, 9% in Pinehurst, 6% in Kellogg, 0% in Page, and 11% in Wardner. In this regard – the reduction of lead exposure to children – the protective measures employed may be considered to be effective in the populated areas.

The ICP has been designed as a "cradle-to-grave" approach and its components are designed to work together. This approach has provided the ability for PHD to enforce the program, maintain comprehensive information about activities in the residential areas, and provide incentives to homeowners to dispose of contaminated soils. PHD staff believe this cradle-to-grave approach is a the key factor of success for the ICP.

6.2 What Did Not Work Well

One concern expressed by PHD staff was that there is currently no provision for long-term funding of the Institutional Controls Program. At present, the plan for funding only covers 10 years (through 2005). The PHD staff believe that there will be a need to continue to operate most aspects of the ICP beyond that date, and the PHD does not have its own funding for provide for the program.

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